NOTICE

All drawings located at the end of the document.

STATE OF COLORADO

WATER DIVISION ONE
OFFICE OF THE STATE ENGINEER
Division of Water Resources
Department of Natural Resources

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April 7, 1995

Mr Tod W Anderson, Director
Site Support Division
U S Department of Energy
Rocky Flats Field Office
P O Box 928
Golden, CO 80402-0928

When replying, please refer to
Rocky Flats Dams A-1, A-2, B-2, B-3, B-4, & C-1
W. Div. 1, DAMIDs. 025619, 025620, 025623,
025624, 025625, 025627

SUBJECT Approval of Design for Dam Toe Drain Rock Blankets

Dear Mr Anderson

I have looked over the package of plans and specifications provided to support the proposed toe drain work at the referenced dams In general, I believe that the design will perform as intended and is constructible I do, however, have the following comments relative to certain aspects of the design.

1 The "fine aggregate bedding material", as specified, is allowed to contain up to 7% fines (-#200 sieve size particles) by weight For a sand material which is intended to be free-draining, it is important to limit fines content to about one-half of the amount specified, or no more than 4% by weight This is a generally-accepted standard in the dam-design field I have actually seen so-called free draining materials having fines content of not much over 5% which were, when compacted in place, essentially impervious

2 In connection with the above item, over-compaction of the sand materials should be avoided The specifications require a minimum compacted density of 85% of modified Proctor (ASTM D1557), which may well be undesirably dense, giving low permeabilities For this type of installation I would recommend compacted sand densities to be targeted for a range of 60% - 75% of relative density, as defined by ASTM D4253 and D4254

3 Where the direction of seepage flow is from the fine aggregate layer into the coarse aggregate layer, as shown by section "C" on plan sheet 3 (typical for Dams B-3 and B-4)

where no drain pipe is used, geotextile fabric should be placed between the fine and coarse aggregate materials to prevent migration of sand particles through the coarse aggregate bedding The coarse aggregate, by itself, does not meet filter criteria with respect to the fine aggregate

4 For those dams where perforated drain pipe is required within the fine aggregate bedding and nonperforated pipe will "T" onto it to carry flows to an outfall, it would be desirable to maintain a wedge of impervious soil between the bedding for the perforated pipe and the bedding for the nonperforated pipe, in order to confine flow to the pipe Otherwise, flow would likely also occur through the sand bedding materials placed alongside and under the nonperforated outfall pipe

Please incorporate the above comments into the design

Relative to the requirements for construction observation, Rule 6 A (3)(a) and the State Engineer's policy do not specifically require oversight by a professional engineer, but in this case I feel it is necessary, and it appears from the construction specifications provided that the intent is to do this Given my current work load, I will be unable to provide a presence on the site during construction and I would therefore like to have the quality of the work verified by an on-site engineering inspector Per the Rule, I would like to be informed when the work is to start and periodically during construction concerning progress and unforeseen problems or changes which develop I will also need to perform a "final inspection" at the completion of the work, perhaps that could be coordinated with the FERC inspections tentatively scheduled for September of this year

The Rule requires the submittal of "As-Constructed" drawings and specifications within sixty days following completion of the work Mylar plans are not required, 11" X 17" prints like those provided for review would be acceptable Because the work involves six dams and is scheduled to be split over a two year period, we may need to wait until the end of year two for the As-Constructed documents We can discuss that further after the first year's work is completed

I appreciate your assistance and cooperation in this process If you have any questions or need to contact me otherwise please feel free to do so at (970) 352-0259

Sincerely,

D. G Miller

Dennis G Miller P E
Senior Professional Engineer

cc Cheryl Row U S Dept of Energy
Dam Safety Branch, Denver

DGM/dgm rfcapl ltr

3 6 BACKFILLING

A Prior to backfilling, clean excavations of all trash and debris, and compact the trench or excavation subgrade to the requirements indicated below in Paragraph entitled "COMPACTION"

1 The existing grade or subgrade to receive fill shall be scarified to a minimum depth of 6 inches before the fill is started, such that the subgrade will be compacted (and moistened or dried, if necessary) to meet the density/moisture requirements indicated below

B. Backfilling shall not begin until construction below finish grade has been approved, unless otherwise noted herein

C Pipe Bedding All trenched piping shall be placed upon a 6-inch *(compacted thickness)* layer of sand bedding material, compacted as specified below. Scarification or compaction of the pipe trench prior to placing the bedding sand shall not be required

1. This pipe bedding applies only to the *non-perforated* piping (see "Section 02510 -- Blanket Drain System" and the Drawings) and any existing utilities which may be discovered.

2 Pipe bedding is not to be placed under the *perforated* piping (see "Section 02510 -- Blanket Drain System" and the Drawings).

D. Initial Utility Backfill for piping sand backfilled to a depth of 6 inches *(compacted thickness)* over the top of the pipe and backfilled as indicated below. Refer to Project Drawings

1. This initial utility backfill applies only to the *non-perforated* piping (see "Section 02510 -- Blanket Drain System" and the Drawings) and any existing utilities which may be discovered.

2 The backfill and compaction ~~requirements~~ for the sand fill ~~(Fine Aggregate Bedding Material)~~ over the *perforated* piping ~~are specified in Section 02290 - Riprap Bedding, Riprap, and Geotextile Fabric~~. AS SPECIFIED UNDER "COMPACTION".

E. Fill shall be placed in horizontal layers not in excess of 10-in *compacted* thickness and shall have a moisture content as specified herein such that the required degree of compaction may be obtained. Each layer shall be compacted by hand or machine tampers or by other suitable equipment. Compaction and testing requirements shall be in accordance with the requirements indicated below.

1. Note that if the Subcontractor cannot attain the compaction densities required below using 10" thick compacted lifts, then the Subcontractor shall reduce the required compacted lift thickness to 6". This reduction in lift thickness shall be done at no additional cost to the Contractor

F. Install Contractor-furnished utility warning tape 12 inches above new pipe and utilities and any existing underground utilities exposed during the work

B The portion of aggregate in the materials listed below that is retained on the No 4 sieve, or is larger than the No 4 sieve, shall be known as coarse aggregate The portion of aggregate in the materials listed below that passes the No. 4 sieve shall be known as fine aggregate

C All materials listed below shall be free of organic matter, debris, and other objectionable materials and coatings

D. No round stones, thin slab type stones, or flaking rock shall be used in any of the materials listed below

E Frozen material shall not be used for any of the materials listed below

F. Definition: Riprap Bedding is defined as a layer of Fine Aggregate Bedding Material (Sand) covered by a layer of Coarse Aggregate Bedding Material, each as specified below.

2 2 FINE AGGREGATE BEDDING MATERIAL (SAND)

A. Fine aggregate bedding material shall consist of clean, sound, durable natural or manufactured sand

B The fine aggregate bedding material shall meet the Fine Aggregate requirements of ASTM C 33 and shall be tested as indicated in ASTM C 136 to ensure that it meets the gradation indicated below Sieve sizes shall conform to ASTM E 11.

Sieve Size	Percent Passing by Weight
3/8 inch	100
#4	95 - 100
#8	------
#16	45 - 80
#50	10 - 30
#100	2 - 10

38 ELR 0001

C Materials finer than No. 200 sieve shall not be more than 3% of total sample by weight when tested in accordance with ASTM C 117.

D. Coal and lignite content shall not be more than 1% of total sample by weight

E. When subjected to five cycles of the soundness test, in accordance with ASTM C 88 using magnesium sulfate, the loss in weight of the fine aggregate in the sand bedding material shall not exceed 15 percent.

F. The Subcontractor shall initital submit test results for approval of fine aggregate bedding material prior to its delivery that establish compliance with the requirements specified.

2 If extensive damage has occurred to the fabric, or if recurring problems occur in its placement and covering with materials, consult the fabric manufacturer's representative for the necessary repair procedures The repair procedure shall be approved by the Contractor prior to implementation

3 3 PLACEMENT OF FINE AGGREGATE BEDDING MATERIAL

A. Preparation of Underlying Material· After placement of the geotextile fabric and prior to placement of the fine aggregate bedding material, the 6-inch polyethylene pipe and tee connections shall be installed. The fine aggregate bedding material shall then be installed to the requirements of the specifications and drawings

B. Placement of Fine Aggregate Bedding

1 Fine aggregate bedding shall be placed on the geotextile fabric in a manner which will prevent segregation.

2 The fine aggregate bedding material shall NOT BE COMPACTED ~~be compacted to 85% of maximum density in accordance with the requirements for pipe bedding and backfill in Section 02200 Earthwork~~, and shall be placed in a manner that will result in a uniform layer of the specified thickness ELR 0001

3 The *perforated* pipe located within this layer of riprap bedding (fine aggregate bedding), where indicated on the Drawings, shall be installed in accordance with "Section 02510 -- Blanket Drain System".

C. Finishing· The surface of the fine aggregate bedding material shall be finished to grade and cross section shown on the drawings. The finished surface shall be of uniform texture Blading or other means may be necessary for the finished surface to conform to the lines, grades, and cross sections Should the surface for any reason become rough, corrugated, uneven in texture, or marked by traffic prior to the subsequent work or the completion of the project, such unsatisfactory portion shall be reworked or replaced as directed by the Contractor's Project Engineer or representative as necessary to achieve the requirements of the specification

D. Smoothness and Grade Tolerance

1 Smoothness The surface of the finished layer of fine aggregate bedding shall show no high or low spots.

2. Grade Tolerance The finished grade of the fine aggregate bedding material shall be within 0.15 foot (plus/minus) of the grade(s) indicated on the drawings

3 4 PLACEMENT OF COURSE AGGREGATE BEDDING MATERIAL

A Placement of Coarse Aggregate Bedding Material

1 The coarse aggregate bedding material shall be placed upon the layer of fine

F The size for the polyethylene pipe and fittings is based on the nominal inside diameter of the pipe Fittings may be either molded or fabricated by the manufacturer Fittings produced by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the Contractor.

G The minimum pipe stiffness for the polyethylene pipe shall be 35 psi, per ASTM D 2412.

2.3 NYLON SCREEN WRAP

A. The perforated pipe shall be wrapped with durable nylon screen (ADS Drain Guard or approved equivalent) The entire length of the drain shall be wrapped Seams in the nylon screen shall be lapped and welded for complete coverage The nylon screen shall be installed in accordance with the manufacturer's recommendations

B Submit manufacturer's catalog data and manufacturer's installation instructions for approval by the Contractor

PART III EXECUTION

3 1 PLACING POLYETHYLENE PIPE

A The perforated and non-perforated corrugated pipe shall be installed in accordance with the manufacturer's recommendations and requirements specified herein

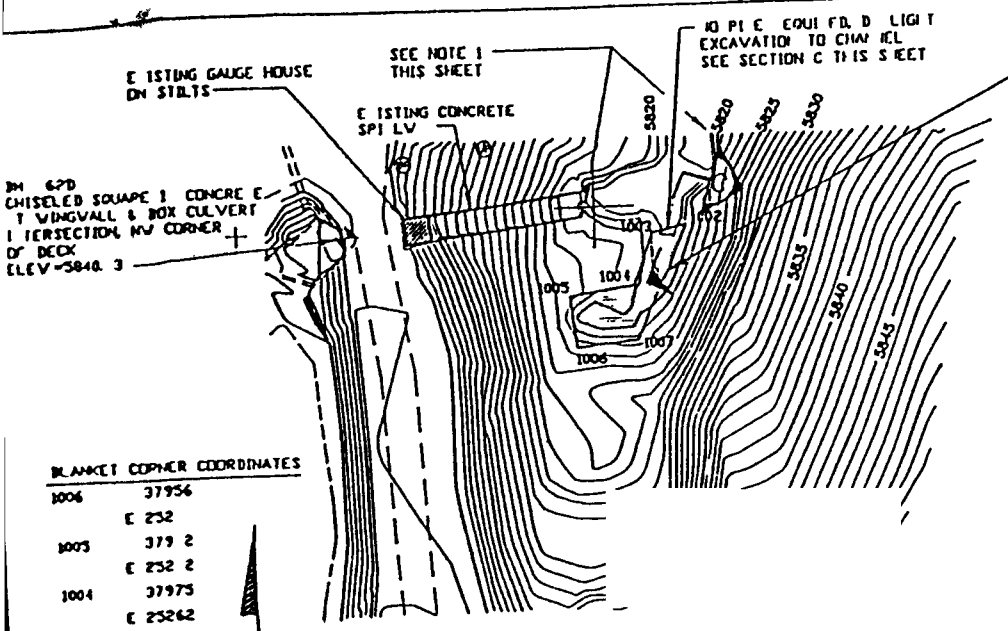
B Perforated Pipe The nylon screen wrap shall be placed around the perforated pipe per the manufacturer's recommendations. The wrapped pipe shall be placed on the emplaced geotextile as shown on the drawings The fine aggregate bedding material shall then be placed over and along the sides of the pipe in accordance with the requirements specified in "Section 02230 – Riprap Bedding, Riprap, and Geotextile Fabric" ~~Special care shall be taken during compaction of the sand to not displace the pipe.~~

C. Non-Perforated Pipe· The non-perforated pipe shall be placed upon sand bedding OR FILL in the excavated trench as indicated on the Drawings and in accordance with the requirements of "Section 02200 – Earthwork", which includes excavation, bedding, backfill, and compaction requirements. Special care shall be taken during the compaction of the sand OR FILL to not displace the pipe.

ECR 0001

END OF SECTION

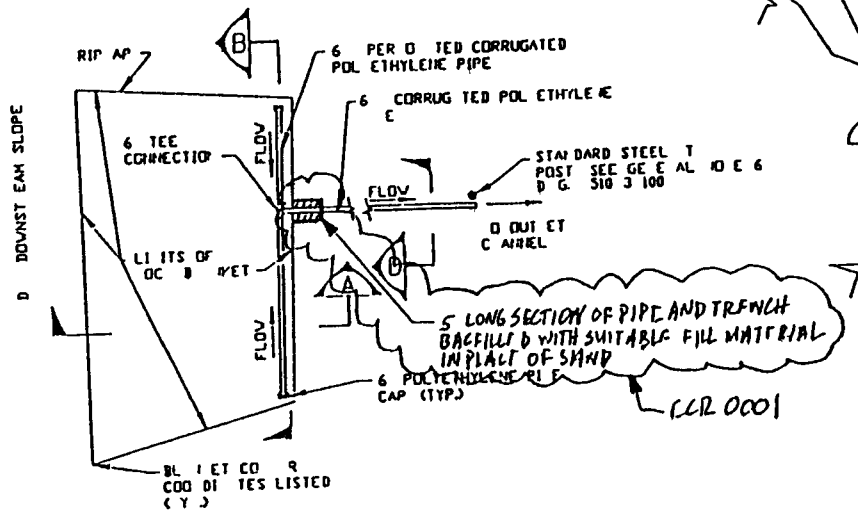
RT	QUAN	DESCRIPTION



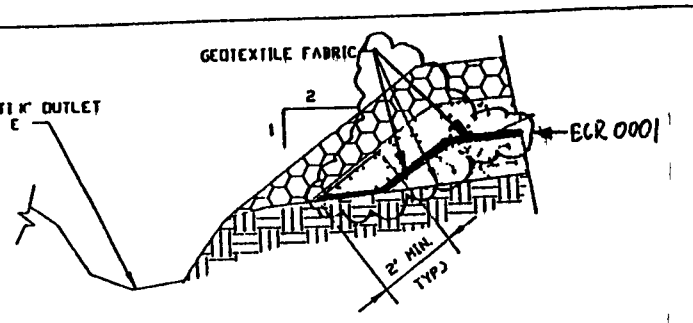
BLANKET CORNER COORDINATES	
1006	N 37956
	E 252
1005	N 379 2
	E 252 2
1004	N 37975
	E 25262
1003	N 3 991
	E 25268
1002	N 3799
	E 252 9
100	N 3 958
	E 25263

DAM B4 TOE ROCK BLANKET
SCALE 1 3

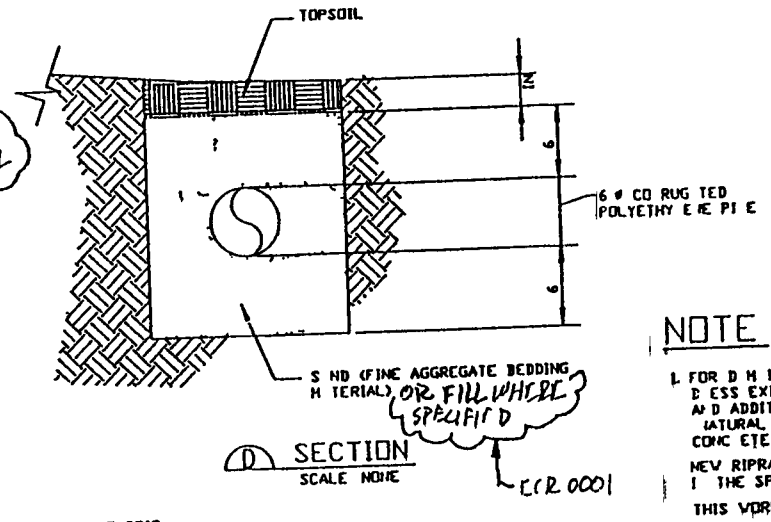
SEE TYPICAL SECTIONS



TYPICAL PLAN VIEW-NEW CONSTRUCTION
SCALE NONE



C SECTION (DAYLIGHT DRAIN)
SCALE NONE



D SECTION
SCALE NONE

NOTE
(SEE DRAWING 510 3 100 FOR GENERAL NOTES CONCERNING THE WORK REQUIRED FOR THIS PROJECT)

1. FOR DAM B ONLY
   PROCESS EXISTING OUTLET CHANNEL BY PLACING EXISTING RIPRAP AND ADDITIONAL RIPRAP AS REQUIRED ALONG THE EXISTING NATURAL CHANNEL TO A HEIGHT MATCHING THE OUTLET OF THE CONCRETE SPILLWAY
   NEW RIPRAP SHALL MEET THE REQUIREMENTS FOR RIPRAP GIVEN IN THE SPECIFICATIONS SIZE SHALL BE TYPE A
   THIS WORK SHALL BE AS DIRECTED BY THE CONTRACTOR.

CONTROL POINTS

CP6
FND #6 REBAR W/TEE POST
ON SOUTH RIM OVERLOOKING POND B
N 37 662.73 8
E 25,472.9289

CP7
FND #5 REBAR W/TEE POST IN CAIRN
N 39 074.2310
E 25,972.8719

CONTROL POINTS

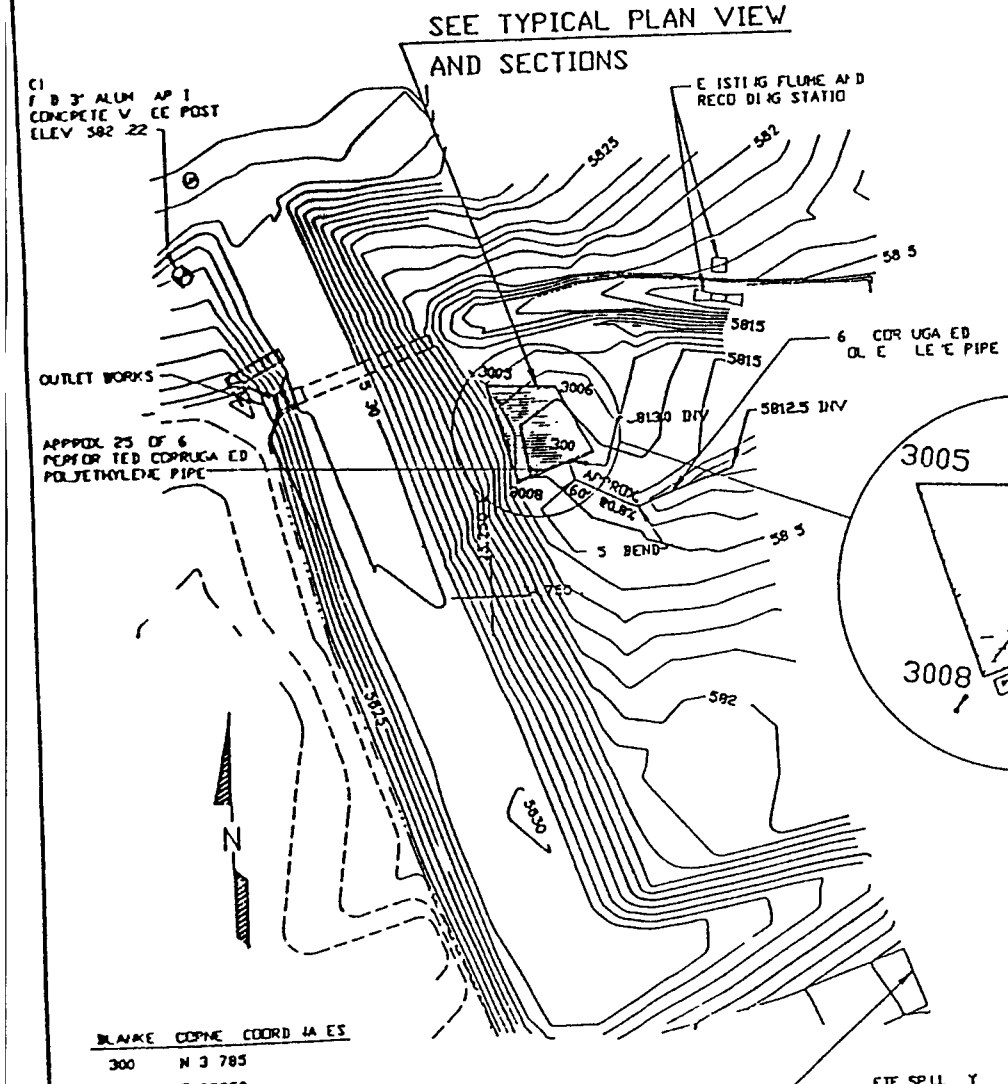
CP1
FND 5 REBAR W/TEE POST
5 40 NORTH ANTENNA BOX
N 33 505.1380
E 22,054.3569

CP304
FND 2 ALUM CAP W/TEE POST
STAMPED 304
N 35,094.7950
E 23,285.8800

LEGEND

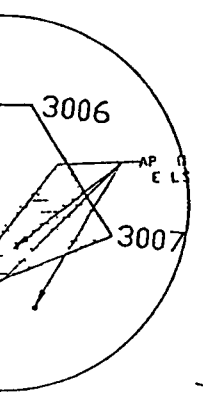
- UTILITY POLE
- BENCHMARK
- DIRT ROAD
- EDGE OF WATER OR CHANNEL FLOW LINE
- 1 FOOT CONTOUR
- 5 FOOT CONTOUR

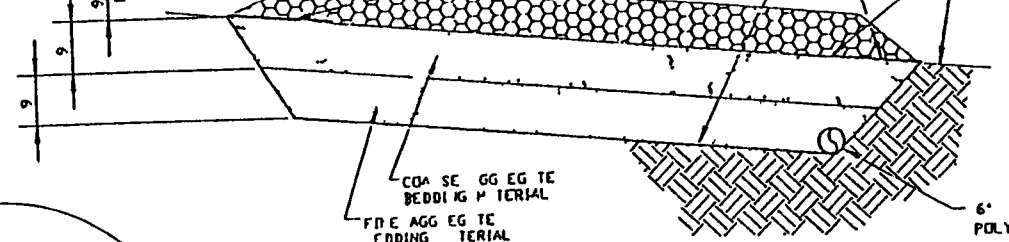
SEE TYPICAL PLAN VIEW AND SECTIONS



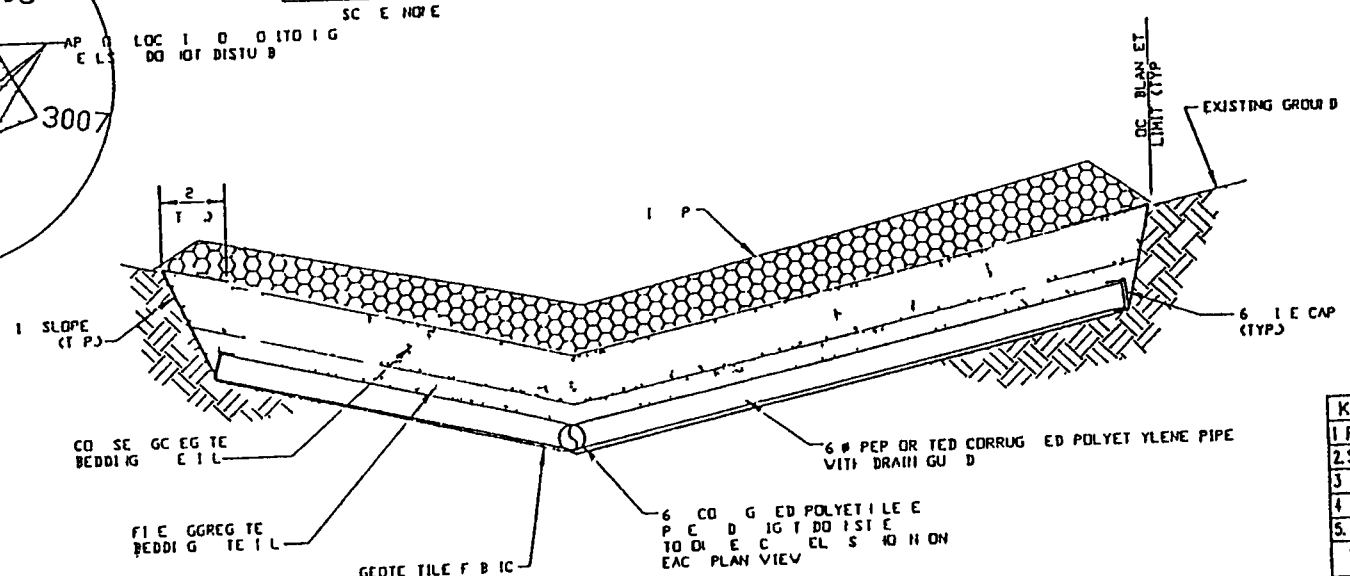
BLANKET CORNER COORDINATES	
300	N 3 785
	E 23259
3005	N 3 815
	E 23258
3006	81

C1 TOE ROCK BLANKET





A TYPICAL SECTION
SCALE NONE



B TYPICAL SECTION
SCALE NONE

INFORMATION ONLY

FOR USE WITH 971134-ECR-0001

KEYWORDS	A	ORIGINAL ISSUE							
1 PLANS	SUE	DESCRIPTION							
2 SECTIONS	TOLERANCES			BY	DATE				
3	FR	DESIGNED			11-15-93				
4	ANGLE ±	DRAWN			12-19-93				
5	DEC ±	CHECKED			12-19-94				
ALWAYS ADJUST AFTER ROOM / AREA	UNLESS NOTED OTHERWISE	APPROVED							
	REMOVE BURRS AND SHARP EDGES								
ENG COORD / DES PKG	NEXT ASSEMBLY								
		SUBMITTED							
	ALIES AS NOTED	APPV RFP							
		APPV DOE							

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS AREA OFFICE, GOLDEN, COLORADO

ROCKY FLATS PLANT
Golden, Colorado 80402

DAM TOE ROCK BLANKETS
B4 C1 AND SECTIONS

97113 | JOB NO | SCALE | SIZE | DRAWING NO
D 51043-101 A | SHEET OF